Long Term Outcomes of On-Pump CABG Versus Off-Pump CABG

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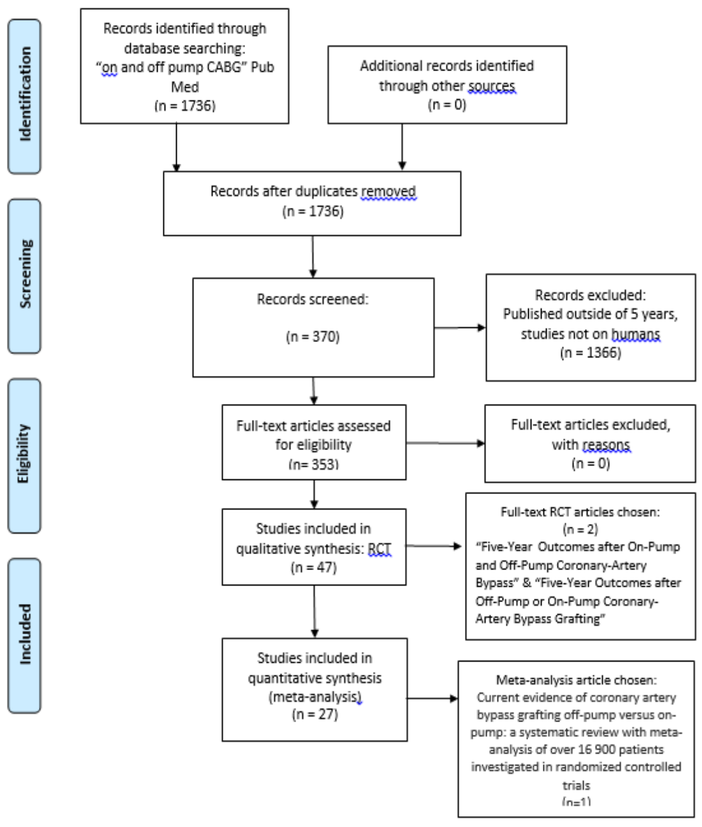
Introduction

Atherosclerotic plaque buildup in coronary arteries leads to approximately 400,000 patients across the United States undergo an invasive procedure called a coronary artery bypass graft each year (Alexander, 2016). CABG remains the most common cardiac surgery in the United States and the standard of care for patients that suffer from left main coronary artery or 3-vessel coronary artery disease (Quinn et al.,2013). However, there are two approaches to performing the surgery which includes a cardiopulmonary bypass pump or performing the procedure off the cardiopulmonary bypass pump. Regardless of approach, the goal of the surgery is to bypass a blockage in a coronary vessel by using other vessels that have been harvested from another location within the body which includes internal mammary arteries, radial arteries and saphenous veins. The procedure is effective in its five year outcomes, however it is unclear whether the benefits of off-pump coronary artery bypass graft is more effective than on-pump artery bypass graft.

Clinical Question: Among patients that meet criteria for a coronary artery bypass procedure, does the on pump CABG procedure as compared to performing the CABG off-pump improve outcomes (mortality, revascularization and myocardial infarction?

Introduction



Results

Study 1: Five-Year Outcomes after Off-Pump or On-Pump Coronary-Artery Bypass Grafting (Lamy et al.)

Objectives: Investigate rate of composite outcomes 5 years after a coronary-artery bypass grafting (CABG) procedure both on and off-pump

Study Design: Cohort Study
Results: No significant differences between the two treatment groups in the composite outcomes
Critique: No cost-effectiveness analysis, quality of life assessment not completed by all subjects, too many outlying variables

Study 2: Five-Year Outcomes after On-Pump and Off-Pump Coronary-Artery Bypass (Shroyer et al.)

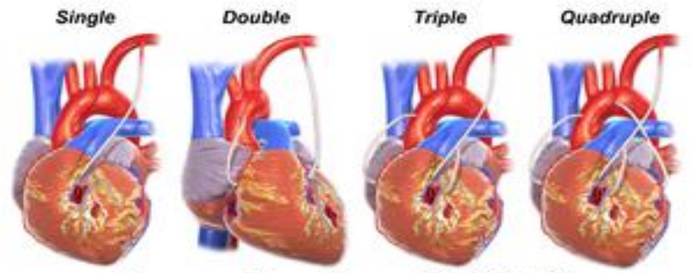
Objectives: Examine the 1-year assessment and the 5-year outcomes of 2203 patients that underwent either an on-pump or off-pump CABG

Study Design: Cohort Study
Results: Off-pump CABG had lower rates of 5-year survival and event-free survival than the on-pump CABG treatment group
Critique: Subset of population from veteran affairs, most were men, stroke not included

Study 3: Current evidence of coronary artery bypass grafting off-pump versus on-pump

Objectives: Determine the current strength of evidence for or against off-pump and on-pump coronary artery bypass grafting (CABG)
Study Design: Meta analysis
Results: Off-pump CABG showed 1.4 fold increased risk for revascularization and cost reduction during shorter hospital stays. Other parameters showed no differences
Critique: Too much heterogeneity in revascularization results, difficult results to read, number of patients varied per outcome

	Lamy et al. (Study 1)	Shroyer et al. (Study 2)	Deppe et al. (Study 3)
Type of study	RCT	RCT	Meta-analysis
Number of patients	4752	2203	16, 904
Follow-up	5 years	5 years	30 Days
Mortality	On-pump: 23.2% Off- pump: 24.6%	On-pump: 42.3% Off- pump: 48.3%	On-pump: 2.1% Off- pump: 1.8%
Revascularization	On-pump: 2.3% Off- pump: 2.8%	On-pump: 12.0% Off- pump: 13.4%	On-pump: 0.4% Off- pump: 0.8% **Percentage based on 10,840 patients*
Myocardial Infarction	On-pump: 8.2% Off- pump: 7.3%	On-pump: 9.3% Off- pump: 11.2%	On-pump: 4.9% Off- pump: 4.6% ** Percentage based on 12,496 patients*



Coronary Artery Bypass Graft (CABG)

Conclusion

Coronary Artery Bypass Graft is critical in the management of coronary artery blockages to sustain life. The decision to perform on-pump versus off-pump CABG depends on the patient and physician having strong communication about comorbidities, surgeon skillset, and risk analysis. Risks and benefits of each procedure needs to be completely disclosed to the patient based off the risk analysis performed by the surgeon. More research needs to be done on the long term effects based on patient characteristics prior to surgery as well as cost effectiveness post operatively. Additionally, it is not possible at this time to determine which approach is more beneficial because not all surgeons are able to perform the off-pump CABG at the same skill level due to years of experience, mentor, and number of opportunities to perform these surgeries. Each study however, has shown that on-pump and off-pump CABG procedures have their risks and benefits allowing for a current conclusion that one approach is not inferior to the other.

Acknowledgments

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